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SUMMARY AND CONCLUSIONS

of

"Methods of Cutting Ponderosa Pine, Salmon National Forest, Idaho"

PLOT NO. I

Progress Report, 1931

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Summary of Results

1. A four-acre sample plot was established in 1909 on the Salmon National Forest in central Idaho in a ponderosa pine stand which had been cut selectively the preceding year. The logging operation removed 7,646 bd. ft. per acre, or 53.2 percent of the original stand of 14,379 bd. ft per acre. The reserve stand averaged 72.3 trees per acre over 3.5 inches d.b.h.; 51.3 sq. ft. of basal area; 1,640.2 cu. ft. of total volume; and 6,733 bd. ft. of merchantable volume.

2. In 1931 the stand had increased to 103.7 trees per acre, with a basal area of 73.6 sq. ft.; a total volume of 2,409.4 cu. ft, and a merchantable volume of 9,843 bd. ft.

3. Annual net increment per acre for the 22-year period averaged 1.012 sq. ft. of basal area; 37.8 cu. ft; or 164 bd. ft.

4. The average tree grew at a rate of 0.073 inch in diameter breast high per year between 1920 and 1931 (the only period for which individual tree records were

available). Ponderosa pine averaged 0.067 inch; Douglar fir, 0.107 inch. This slow rate of growth compared to that obtained else where in Idaho may be ascribed to (1) poor site -- site quality is a low IV, (2) large number of mature and overmature trees, and (3) overcrowding within groups.

5. The stand was increased by the addition of 1.66 trees per acre per year growing into the 4-inch class. More than half of the total increase came during the period 1926-1931. These "new trees" contributed 13.2 percent of the cubic-foot increment between 1920 and 1931, which slightly more than offset the volume loss by mortality.

6. The maximum rate of volume increment of the reserve stand (41.1 cu. ft. per acre per year) was attained in the period 1912-20. The rate decreased through the succeeding two periods covered by the plot measurements (1920-26 and 1926-31). This decrease resulted in part from greater competition by the increasing number of younger trees (the increment of which helped to compensate for the decrease in that of the initial reserve stand), and presumably in part from a deficiency in precipitation during 7 out of the 11 years in this period.

7. A total of 19 trees died between 1920 and 1931 - an average annual loss per acre of 4.12 cu. ft. or 17.3 bd. ft. This loss was equal to 9.5 percent of the gross increment or 0.2 percent of the initial volume. An unusual attack of immature pines by the mountain pine beetle was responsible for the death of 68 percent of the number of

trees killed, but the largest volume loss was from windthrow. All losses occurred between 1926 and 1931.

8. Analysis of increment of individual pine trees by silvicultural (Dunning) tree classes shows average annual increases in diameter as follows: Class 1 - .14"; 2 - .08"; 3 - .06"; 4 - .04" ; 5 - .04"; 6 - .03"; 7 - .02". In order of relative gross volume increment (growth percent) the classes rank: 1, 2, 6, 3, 4, 5, 7. As usual, the immature classes 1 and 2 are growing at distinctly superior rates in relation to their "wood capital". Tree classes 4 and 7 show small net losses, due to windthrow and barkbeetle attack.

9. Reproduction records are very incomplete, but such as there are indicate that the stand was fairly well stocked with pine and fir seedlings at the time of cutting, that this advance reproduction has survived and grown reasonably well, and that subsequent reproduction has been established very slowly to make a total for the 22-year period of perhaps 500/acre. In 1931 the area was still not fully stocked because of uneven distribution, although the number per acre of established pine seedlings and saplings (6" high to 3.5" d.b.h.) averaged 849; Douglas fir, 962; total, 1,811.

10. Douglas fir increased progressively in proportion to pine both in the stand and in the reproduction. The more rapid rate of growth and lower mortality of fir and large proportion of fir in the new trees growing into the stand increased the proportion of cubic volume of this

species from 20.9 percent in 1909 to 24.0 percent in 1931. In the older reproduction the proportion of fir changed from 31 percent in 1909 to 53 percent in 1931. The trend is believed to be a natural one for a basin site in this region, and probably was influenced very little by cutting.

11. The accuracy of using periodic increment as a basis for prediction of growth on the plot itself was checked by projecting the actual rates of growth for the period 1920-26 through the succeeding period 1926-31. The net increment in cubic feet thus computed exceeded actual growth for the period by 12.7 percent, largely because of failure to estimate the mortality which occurred.

12. Growth prediction by the "Meyer method" for the 22-year period showed net yields which were 15 percent low in basal area and cubic-foot volume and 9 percent low in board-foot volume compared with actual results.

Conclusions; Application:

The stand left after cutting was materially heavier than in most later Forest Service timber sales and cannot be considered as representative of an "18-inch diameter limit cutting", but rather as a straight selection cutting among the trees of the stand larger than 18 inches d.b.h. The gross rate of volume growth was not as large as might be expected on such a large reserve; it is only about one forth greater than that yielded by a reserve volume less than half as large on sample plots on the Payette National Forest(6). Unfortunately there are no other plots of different treatment or reserve stand on a really comparable

site, so that it is difficutl to tell to what extent the measured rate of increment was the "natural" yield of the site and how much it might vary with size and structure of the reserve stand (i.e. with marking practice). The results of applying the Meyer method of growth prediction (p. 29), which takes into account all these factors, suggests that the yield was a little above average for the given conditions and hence reasonably satisfactory. It is doubtful whether, with the same reserve volume, any greater growth could have been obtained by selection of different trees for cutting, as it appears from the meager records that only the largest and ripest trees were cut.

The comparison of increment of different tree classes (p. 19) confirmed the results obtained else where in showing the superiority of Class 1 and to a lesser degree Class 2 and 3 trees as volume producers. This leads to the important question, would it have been better to have marked heavier in the mature tree classes to eliminate some or all of these slow growers? The answer is not simple. It involves further questions of management plans, quality versus quantity production, seed tree value, etc. From the growth stand point alone, suppose that all of the Class 4, 5, and 7 trees had been cut: the net growth percent (1920-1931) would have been raised from 2.06 percent to at least 3.25 percent, but the actual rate per year would have increased increment somewhat but not greatly, as most of the older trees were in positions where they had little effect on the younger). If an early second cut of trees of profitable

size was desired it is obvious that the large reserve was almost essential. Moreover, the "quality growth" of select lumber in these older trees helps to compensate for their slow rate of wood production. It is difficult to appraise their effectiveness as seed trees -- much of the present quantity of reproduction (2,300 per acre) may be credited to advance growth, and a closer field study would have been required to determine just how much subsequent stocking of blank spots resulted from seeding of these older trees. Their contribution has been material, but perhaps not indispensable. Mortality has beenheld to a low figure in spite of the reservation of these "risky" classes of trees. The probability of complete loss through death is, however, one of the strongest arguments for cutting them. They are still in considerable danger of attach by barkbeetles (D. brevicomis) which are continuing to cause losses in nearby stands.

Miles[5/] concluded that most of the mature trees should have been cut. The present report substantiates his showing that they have been poor producers, but points out that their retention was not necessarily a mistake but could readily be justified by the facts that : (1) in general they contributed a positive increment of high value lumber; (2) they have made possible a much earlier or larger and more valuable second cut; and (3) they are providing a large share of the seed required for adequate restocking.

Another modification of cutting that it seems would have been desirable is a thinning out of certain groups of

immature trees by the removal of some small-crowned Classes 6 and 2 trees. Such cutting is, of course, practical only where there is a market for pole timber.